Innovative Grid Positioning System (GPS) For Endoscopic Laser Transforaminal Microdecompressive Lumbar Disc Surgery in the Morbid Obese

John C Chiu, MD, FRCS (US), DSc
Chief, Neurospine Surgery
California Spine Institute
Thousand Oaks, California, USA
President AAMISMS
California Spine Institute Medical Center, Inc

"Greetings from CSI"

你好
Kinh Mơi
“Bonjour”
“Buenos Días”
“Guten Tag!”
“Konnichí wa”

Calif. Center for Minimally Invasive Spine Surgery
Introduction:

- **The morbid obese** - more than 100 pounds over ideal body weight, or a **BMI of 40** or higher. More than **5 percent of Americans**
- **Double** the incidence (2.41x) of low back pain
- **Greater incidence** of surgical complications, up to 36% including wound healing, infection, pneumonia, DVT and repeated surgery
- **Under anesthesia**, have **increased risks** including **difficult airway control** and **intubation, ventilation/perfusion** mismatching, altered pharmacokinetics of anesthetics and drugs
- Risk of **developing other co-morbidity diseases**, i.e. **diabetes, hypertension**, cardiovascular disease, **stroke**, restrictive lung disease, osteoarthritis and others
- Six or more **co-morbid conditions in 25 percent**
Surgical Indications:

- **Symptoms** - intractable radiculopathy associated with paresthesia, sensory loss, muscle weakness and/or decreased reflexes
- **Neurogenic claudication** on ambulation
- Failed **conservative therapy**
- **Positive neurological findings** – DTR, sensation
- **Positive imaging findings** on MRI or CT scan for disc herniation
- Positive **provocative discogram**
- Positive **EMG** considered helpful
- **Multiple discs** can be treated during one procedure
- Post fusion junctional disc herniation syndrome (**JDHS**)
Material and Method:

- Since 1995, **203 morbidly obese patients** - 330 herniated lumbar discs
- Average **age of 42.2** (20 to 67) - symptomatic, single or multiple herniated lumbar discs
- **Males: 99 Females: 104**
- Each failed at least 12 weeks of conservative care
- **Post operative follow up**: 7 to 60 mos. (average **46.1 months**)
Surgical Procedure/Technique:

Pre-op Prep Anesthesia

- **Local anesthesia** and monitored **IV conscious sedation**
- 2 grams Ancef and 8 mg dexamethasone IV pre-op
- **Surface EEG monitoring** (BIS)
- **IOM - EEG, EMG** to prevent undue neural trauma

Positioning and localization – surgical portal of entry
Surgical Procedure/Technique:

Endoscopic Laser Spinal Instruments

- Endoscopic **duck bill tubular retractor**, slanted opening
- For **navigating into the grid – GPS** to avoid neural vascular injury
- To remove **difficult deep lesions**, even **behind the pedicle**
- Various size of drills and trephines for spinal micro-decompressive laser discectomy and decompression of osteophytes
- For successful endoscopic MISS
Surgical Procedure/Technique:

Endoscopic Laser Spinal Instruments

Close up view

- **Duck bill tubular retractor** with dilator to enter the GPS for lumbar disc surgery to avoid dura and neuro vascular injury

- Under endoscopy and fluoroscopy, trephine forceps, curette, rasp, knife, discectome, and laser are utilized for micro decompressive discectomy and **laser thermodiskoplasty**
Surgical Plane/Approach/Technique:

Right posterolateral approach - prone position

for endoscopic laser lumbar MISS
Surgical Plane/Approach/Technique:

Left lateral decubitus position for right posterolateral endoscopic laser lumbar MISS
**GPS (Grid Position System) for Endoscopic Laser MISS**

Provides **safe and precise** lumbar spine surgery

- Lumbar spine has neuro foramen and intra-lamina **foramen openings** restricting portal of entry
- **Critical structures** within the foramen – DRG, neural structure
- **GPS** provides a **precise and safe path to reach the lesion and to avoid trauma** to the nerve vessels, DRG, dura and even the spinal cord
- **The grid** – the GPS System – Zones (in A,B,C, D and 1,2,3) **provides an accurate navigation map** for MISS
Endoscopic Laser MISS Technique: With GPS

- Obese patient had left posterolateral endoscopic laser lumbar discectomy with GPS system
**GPS** (Grid Position System) for Endoscopic Laser MISS

Fluoroscopic/imaging and endoscopy to provide safe and precise lumbar MISS discectomy and foraminoplasty
Surgical Procedure/Technique:

Endoscopic Surgical Approach

Flexible cutter grasper forceps

Endoscopic bone ronguer
Surgical Procedure/Technique:

Endoscopic MISS and Laser Thermodiskoplasty

- Mechanical microdiscectomy
- Laser thermodiskoplasty (LTD) for disc shrinkage and tightening
- Disc fragment removal

Microdiscectomy with micro forceps

Side firing laser probe for LTD

Disc fragment removal
Surgical Procedure/Technique:

Holmium YAG laser with photo thermal effect and mechanism:

**MOSES EFFECT**

- Absorbed by water
- A pear shaped cavitation bubble formed by vaporization of water molecules, undergoes expansion and collapse - resulting in acoustic and shock wave emission
- Simultaneously a vapor channel is formed that effectively conducts laser energy to the target “MOSES EFFECT”

Parting the water (Red Sea)
Surgical Procedure/Technique:

- Spinal discectome for rapid disc removal
Surgical Procedure/Technique:
Para-medium SMART Endolumbar Laser Spine System

- SMART Endolumbar System dilatation technology, is designed
- It is an effective, safe, and easier MISS for treatment of herniated discs, intraspinal lesions, and spinal stenosis
- It preserves spinal segmental motion
- An excellent access for spinal arthroplasty and even fixation
Surgical Instruments and Equipment:

Tissue Modulation Technology
laser, radio frequency and cryogenic technology requiring monitoring/display for control.

Holmium YAG laser generator

Radiofrequency generator
Post Operative Care:

- **Ambulatory within one hour** and **discharged** subsequently
- May shower the following day
- **Ice pack** is helpful
- Mild **analgesics** and muscle relaxant are required at times
- **Progressive spine exercise** second post operative day on
- Postoperatively on average, **resumed usual activity in a few days** and in 2-5 weeks resumed full active lives, providing no heavy work
Case Illustration I:

- Morbidly Obese

- 36 year old male, 450 lbs, one hour after his successful endo L4 & L5 micro laser discectomy with GPS

- He was turned down for open lumbar disc surgery due to morbid obesity
Case Illustration II:

Multiple level herniated lumbar discs - “not a candidate for open spine surgery”

- Morbidly Obese
  - 48 year old male, 450 lbs, one hour after his successful endo L4 & L5 laser micro discectomy with GPS
  - He was turned down for open lumbar disc surgery due to morbid obesity
Surgical Outcome:

- For **203 patients**, average follow-up **46.1 months** (7-60 months)
- Overall result: **183 (90%)** patients with **good to excellent results**, fair results **13 (6.4%)** patients (single level)
- Various evaluations of response to treatment: modified Mac Nab criteria, Oswestry disability score/index (ODI), visual analogue pain scale (VAS), patient satisfaction scoring, pain diagram and/or patient target achievement score (PTA) for assessment were utilized
  - **Average satisfaction score** – 189 (93.1%) patients
  - 14 (6.9%) patients had mild residual pain and paresthesia, although overall their pain lessened
  - **Complication rate**: less than 1%
  - **No cardio pulmonary or vascular complications**
Discussion:

The **advantages of** Minimally Invasive Spinal Surgery (MISS) for the **Morbid Obese are numerous:**

- Through a very small incision
- Less tissue trauma – tissue sparing approach
- MISS has fewer complications (less than 1%)
- Often local anesthesia with IV sedation
- Early ambulation and post – op exercise
- **Ideal for high risk anesthetic patients including morbidly obese, emphysematous, and cardiac conditions**
- IOM - Intra-operative neurophysiological/EMG monitoring, and direct visualized endoscopy provides a safer surgery
- Preserves spinal motion
Conclusion:

- **MISS techniques with GPS and laser thermodiskoplasty to treat morbidly obese and high-risk patients** is an **effective, safe, and less traumatic spine surgery**
- Avoids the more dangerous alternative of open spinal surgery
- This **less traumatic outpatient procedure avoids and reduces the risk and complications** of open spine surgery
- It is a **smart way to perform spinal surgery for the morbid obese**
References:


Hope you enjoyed this presentation!

Thank you for your kind attention!

Thank you

Danke schon

Merci

Arigato

Camón

Gracias

John C. Chiu, M.D., FRSC (US), D.Sc.

California Spine Institute